



The Power of Simplicity: Processing Fluency and the Effects of Olfactory Cues on Retail Sales

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Abstract

Although ambient scents within retail stores have been shown to influence shoppers, real-world demonstrations of scent effects are infrequent and existing theoretical explanation for observed effects is limited. The current research addresses these open questions through the theoretical lens of processing fluency. In support of a processing fluency explanation, results across four studies show the complexity of a scent to impact consumer responses to olfactory cues. A simple (i.e., more easily processed) scent led to increased ease of cognitive processing and increased actual spending, whereas a more complex scent had no such effect. Implications for theory and retail practice are provided.

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Introduction

The effects of sensory cues on consumers have long been explored in the context of environmental psychology and in particular, marketing (Peck and Childers 2008). While music has historically been the most commonly studied cue (Milliman 1982; North and Hargreaves 1998), a significant amount of work has focused on the effects of olfactory stimuli on consumers (Bosmans 2006; Krishna, Elder, and Caldara 2010; Krishna, Lwin, and Morrin 2010; Mitchell, Kahn, and Knasko 1995; Morrin and Ratneshwar 2003; Spangenberg, Crowley, and Henderson 1996). There is little empirical evidence, however, beyond the effects of olfactory cues on proximal dependent variables. Indeed, researchers often only report effects of scents on attitudes and intentions, rather than purchase behavior. Of studies examining the effect of scents on actual sales (Chebat, Morrin, and Chebat 2009; Hirsch 1995; Michon, Chebat, and Turley 2005; Morrin and Chebat 2005; Schifferstein and Blok 2002; Spangenberg et al. 2006), a positive effect has been reported. Unfortunately, limited evidence for a theoretical

explanation has been provided regarding this generally positive effect of olfactory stimuli on sales.

Conceptually, much of the published research on the effects of olfactory cues has relied upon the stimulus-organism-response paradigm (Mehrabian and Russell 1974), the core of which suggests that a pleasant scent triggers a positive affective state in the consumer, which in turn evokes approach behaviors (Spangenberg, Crowley, and Henderson 1996). Other various theoretical explanations for observed effects have also been suggested (Bone and Ellen 1999; Chebat and Michon 2003), with fluency being the most recently postulated mechanism (Haberland et al. 2009; Leimgruber 2010). As with nearly all research in this domain, however, there is little empirical support in the form of process evidence to confirm this recent conjecture. Thus, while olfactory cues can be used to influence consumer reactions to various stimuli (e.g., the retail environment, products, and ads), contribution of the current research is to offer an alternative process explanation for the effects of scent in the marketplace. We propose and support with empirical evidence the construct of fluency—manipulated by varying scent complexity—as an underlying psychological mechanism for some olfactory effects.

In particular, the metacognitive construct of processing fluency (Schwarz 2004) is applied in the context of scent cues with the expectation that this construct holds promise for explaining many of the observed effects within environmental psychology. Processing fluency is defined as the experienced ease

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of processing a stimulus (Schwarz 2004); the paradigm suggests that the ease with which a person can process incoming information is concerned primarily with stimulus form (Reber, Wurtz, and Zimmermann 2004). Consistent with this theory, we propose that scents elicit differential responses depending upon the ease of cognitive processing associated with a particular olfactory cue (as has been shown with visual stimuli; Reber, Schwarz, and Winkielman 2004; Reber, Winkielman, and Schwarz 1998; Winkielman and Cacioppo 2001). By adopting a fluency-based approach, physical characteristics of the scent itself are considered—an approach infrequently employed in the marketing literature. Prior research has predominantly focused on scent characteristics in relation to retailers and/or products associated with the scent (e.g., effects of scent congruity; Bone and Ellen 1999).

Thus, the effect of scent complexity on cognitive processing and customer buying behavior in a retail store and the laboratory are examined herein. We begin by presenting background on processing fluency and propose application of the concept to olfaction. This discussion is followed by a summary of relevant marketing-related olfaction research reviewed from a perspective theoretically consistent with fluency. Research questions are empirically tested in four studies, one in the field and three in the lab. Implications of our findings relevant to theory and practice are discussed.

Background

Although the effects of olfactory stimuli on consumers have been the subject of much research in marketing over the last two decades, most research relies upon stimulus-organism-response explanation as to how scents influence actual behavior and why some scents show an impact on consumer behavior and others do not. We propose herein that the effects of scent on consumers can be usefully interpreted from a fluency perspective, such that easier to process (or more fluent) olfactory stimuli will lead to favorable marketing outcomes (i.e., increased sales). Given that fluency has not previously been used as a lens through which olfactory effects can be viewed, further development of this basic idea is warranted.

Processing fluency

Processing fluency refers to the metacognitive experience surrounding the ease of performing a mental action. The core assumption of this theory is that people internally monitor the effort expended on performing a mental process and that this subjectively perceived ease of processing manifests itself as an accessible feeling (Schwarz 2004). This feeling can then have an effect on subsequent judgmental tasks through two-step attribution processes or through elicited affect (Oppenheimer 2008; Winkielman et al. 2003; Winkielman and Cacioppo 2001). While subjective feelings of processing ease can be elicited in a variety of ways (e.g., retrieval of stored memories, construction of attitudes or preferences), the focus of the current research is on the perception and processing of an encountered external stimulus (Schwarz 2004)—in particular an olfactory cue.

The ease of processing of an external stimulus is referred to as processing fluency and can be influenced by perceptual stimulus characteristics such as simplicity, symmetry, figure-ground-contrast or clarity (Reber and Schwarz 2006; Reber, Schwarz, and Winkielman 2004). The literature suggests that increased processing fluency associated with a given stimulus will increase liking of the stimulus and positively impact subsequent evaluations as well as choice behaviors (Lee and Labroo 2004; Schwarz 2004). This relationship can be explained from an evolutionary point of view: fluency signals familiarity and safety, which have highly positive associations in our early ancestors' environments (Halberstadt and Rhodes 2003).

Processing fluency as a subjective experience of ease accompanies every perceptual act and is felt at the periphery of conscious awareness. This feeling, therefore, may not be the focus of a person's attention and is not always reflected in the conscious experience (Winkielman et al. 2003). Thus, although fluency is often defined as a subjective experience, it is normally measured in terms of objective fluency, which is assumed to reflect the experienced feelings. Objective fluency refers to the dimensions of speed, resource demands, and accuracy of mental processes and can be measured in a variety of ways (Reber, Wurtz, and Zimmermann 2004).

Processing fluency has only recently been empirically examined in the marketing literature. For example, Labroo, Dhar, and Schwarz (2008, experiment 1) showed that when people are confronted with the task of choosing between two bottles of wine, they were more likely to select the bottle that was more perceptually fluent due to a semantic priming procedure experienced prior to choice. Further, in an analysis of actual market data, Landwehr, Labroo, and Herrmann (2011) found that auto manufacturers whose model designs were easier to process (due to consistency with a mental prototype) experienced stronger sales. In addition to these examples, the basic principles of processing fluency have also been usefully applied to the design of brand logos (Janiszewski and Meyvis 2001), advertisements (Labroo and Lee 2006; Lee and Labroo 2004) and processes in choice-set situations (Novemsky et al. 2007). While the above referenced work has primarily focused on fluency elicited by visual properties of a stimulus, there is also work applying the principles of fluency to other sensory systems including sounds (Repp 1997) and tastes (Lévy, MacRae, and Köster 2006). While predicted from a feeling-as-information theoretical perspective, no published work to date explores the effects of fluency in the domain of scent or cross-modal effects (Reber, Schwarz, and Winkielman 2004; Reber, Wurtz, and Zimmermann 2004; Oppenheimer 2008). Cross-modal effects refer to inducing fluency (e.g., using a scent) and witnessing its effects in response to the same or another (e.g., predominately visual) stimulus.

Olfaction and perceptual fluency

Researchers since the mid 1990s have demonstrated that olfactory stimuli can influence consumer cognitions (Bone and Jantrania 1992), affect (Bosmans 2006), attention (Morrin and Ratneshwar 2003), product evaluations (Spangenberg et al.

2006), and purchase behavior (Chebat, Morrin, and Chebat 2009). Most published findings have depended on various contextual factors influencing the impact of scents on consumers, such as the appropriateness or congruity of the scent associated with products (Bosmans 2006; Mitchell, Kahn, and Knasko 1995) and store environments (Spangenberg et al. 2006; Spangenberg, Grohmann, and Sprott 2005), salience of the scent (Bosmans 2006) and brand familiarity (Morrin and Ratneshwar 2000, 2003). Support for various proposed theoretical explanations of observed effects, however, has been equivocal. Further, other than work showing that pleasant scents lead to more favorable consumer responses (Spangenberg, Crowley, and Henderson 1996), research in the field has also not examined how and which characteristics of a scent are more (or less) likely to affect consumers' attitudes, evaluations, and behaviors in ways that are meaningful to marketing professionals. The current work therefore considers the basic genesis of olfactory cue effects—namely, the physical structure of a scent and any associated effects.

Scents are made up of individual or multiple ingredients comprising differing levels of information to be processed (Garner 1974; Nicki, Lee, and Moss 1981; Reber, Schwarz, and Winkielman 2004). For example, a scent can contain a single dimension (e.g., lemon) or more typically several dimensions (e.g., a blend of citrus ingredients). In this work we examine the effects of such differing scent structures—the construct we label scent complexity. The food science literature has used the approach of adding components to an original, simple sensory stimulus to manipulate cue complexity. Among others, effects have been demonstrated for the impact of food complexity on repeated consumption (Weijzen et al. 2008), the effects of aroma composition complexity on satiation and food intake (Ruijschop et al. 2010), and the impact of flavoring agent complexity on perceptions of texture (Saint-Eve, Enkelejda, and Martin 2004). Given the close relationship between flavor and scent, scent complexity was approached in a similar manner herein. We manipulate scent complexity following the work of Lévy, MacRae, and Köster (2006) who altered food complexity by creating flavors containing differing numbers of ingredients with the idea that the additional flavor ingredients were more complex and thus more difficult to process.

As the oldest of human senses, the sense of smell is the most elementary instrument by which an organism perceives the environment. The sense of smell differs fundamentally from our other senses in that its projections from the nasal cavity pass to the olfactory bulb and from there directly to the hippocampus in the limbic system. Unlike with other senses, the neural projections involved in this process do not cross the opposite hemisphere of the brain. That is, the sense of smell has a direct link to the hippocampus, not passing through the thalamus as happens with our other senses (including vision) (Carmichael, Clugnet, and Price 1994; Farbman 1992; Herz and Engen 1996; Zurawicki 2010). Given this significant difference, we propose that an olfactory cue should be more or less easy to process depending upon the complexity of the cue itself, as with stimuli perceived by the other senses. As such, we expect that complexity of a scent (a common fluency manipulation used in other

sensory contexts) is likely to influence effectiveness of a given olfactory cue.

Perceptual fluency would predict that greater ease in processing of an olfactory cue should generate greater affect, which in turn will influence associated attitudes and behaviors. The effect associated with the ease of processing a scent may then be misattributed to the retail environment and/or products associated with the scent, since scents are peripheral cues that are likely to be perceived with less focal attention than visual cues. In support of this position, it is well established in the literature that odors require little, if any, cognitive effort to be experienced (Ehrlichman and Halpern 1988) and basic behavioral responses can occur without conscious attention. Further supporting this perspective is that, as suggested above, olfactory cues are processed in a more primitive portion of the brain, rather than in higher-level centers as are other sensory cues (Herz and Engen 1996).

Much of the existing marketing literature regarding effects of olfactory cues is theoretically interpretable from the perspective of fluency. For example, scents congruent with product offerings and/or the retail environment lead to greater liking and increased effort dedicated to processing (Mitchell, Kahn, and Knasko 1995), as well as more holistic processing and increased satisfaction (Mattila and Wirtz 2001). These results are consistent with a fluency explanation, as congruent scents should also be more fluent for consumers to process. Further evidence supportive of fluency's usefulness as a lens through which olfactory effects can be viewed is found in a field study by Spangenberg et al. (2006), showing that gender-specific scents resulted in more favorable customer responses in a retail store when scents were congruent with the shopper's gender. In addition to congruence, gender consistent scents should arguably be more fluent since a feminine scent should be easier for a female shopper to process than a male shopper, and vice versa. Similarly, scent-congruence-related results reported by Mitchell, Kahn, and Knasko (1995) can be viewed from a fluency perspective. In particular, incongruent scents in that research may have interfered with cognitive processing of relevant information such that the task became cognitively more difficult for the consumer, thus inhibiting attitudinal judgments. In contrast, when the cue or odor was congruent with the product class, judgments may have been facilitated by ease of processing.

In addition to scent congruency, work by DeBono (1992) can also be interpreted using perceptual fluency as a framework. In that paper, he demonstrated heuristic processing in the presence of a scent, while more systematic processing was associated with evaluations in the absence of scent. In the fluency literature, Oppenheimer (2008) similarly showed that fluency clearly plays a role in a person's reasoning by influencing the adoption of processing strategies. Further, Alter et al. (2007) showed disfluency (i.e., the opposite of fluency) to increase people's reliance on systematic processing cues when evaluating a persuasive communication. From this perspective, it could be that the presence of scent increased the ease of processing in DeBono's (1992) study and the use of heuristic processing, in contrast processing fluency was not elicited in the no scent (or

disfluency) condition where participants relied more heavily on a systematic approach.

Based on the theoretical paradigm of perceptual fluency, a fluent ambient olfactory cue should lead consumers to more favorable responses to the retail environment and associated products. This basic proposition is tested in the current research. As with other successful demonstrations of experienced fluency, scent fluency can be manipulated by means of creating olfactory cues with differing degrees of complexity (simplicity) or, in other words, differing amounts of information to be processed (Garner 1974; Nicki, Lee, and Moss 1981; Reber, Schwarz, and Winkielman 2004). Building upon the work of Lévy, MacRae, and Köster (2006), a scent with a single dimension (e.g., lemon scent) should be easier to process than a scent containing multiple dimensions (e.g., a blended lemon and basil scent). In particular, the amount of information contained in a scent comprises ease of processing manipulation in our studies. This approach is supported by research showing that the number of pharmacological properties or chemical compounds in odors can induce changes in cognitive operations (Johnson 2011). Provided that simple scents are more readily processed than those that are complex, a fluent or simple scent, as compared to a disfluent or complex scent, is expected to increase processing fluency. Given that a complex scent is not expected to similarly increase processing fluency, such a scent should not increase cognitive processing as compared to a no scent (control) condition. Thus, a fluent or simple ambient scent will lead to an increase in cognitive processing, as compared to a disfluent or complex ambient scent or to no scent at all. This increased processing should then translate into increases in variables associated with better processing (e.g., cognitive performance, attitudinal responses, and purchase behavior).

Overview of studies

In a series of studies, evidence is provided for a fluent or simple ambient scent leading consumers to increased purchases in an actual retail store (Study 1), differential cognitive processing (Study 2a and 2b), and increased spending in a simulated shopping task (Study 3). The main studies are preceded by details of pretesting conducted to select appropriate scents subsequently used in the research. We then move to the field with Study 1, whereby the effect of scent fluency is tested on actual consumer purchases in a retail setting. Contributing to our understanding of the effects observed in Study 1, Studies 2a and 2b test how simple versus complex ambient scents can influence basic information processing. Building upon previous research demonstrating that solving cognitive tasks depends on processing fluency (Oppenheimer 2008; Reber, Schwarz, and Winkielman 2004), these studies show that performance on a cognitive task is enhanced by the presence of a simple ambient scent (in comparison to a complex one or no scent at all). Study 3 is a controlled lab study that builds upon these findings. Specifically, Study 3 replicates the spending pattern found in Study 1 and directly tests for the underlying mechanism of processing fluency.

Pretests

Development of scents used in the current work, and procedures for pretesting these scents, were adapted from prior research focused on determining the complexity of nonolfactory stimuli (Lévy, MacRae, and Köster 2006). For this research, scent fluency was operationalized by developing scents varying in terms of complexity, based on the rationale that more complex olfactory stimuli contain more information to be processed, thereby decreasing ease of processing as compared to simple scents (Reber, Schwarz, and Winkielman 2004). Complexity, as a manipulation of fluency, is a stimulus characteristic generally independent of individual experience with that stimulus (i.e., as compared to prototypicality), and it can be measured and/or manipulated in objective terms by adding components to the odor base (Ruijschop et al. 2010).

Two pretests were conducted—one in the field and one in the lab. The goal was to determine a selection of ambient scents varying in terms of complexity, but not differing along other theoretically relevant dimensions. Following Lévy, MacRae, and Köster (2006) and Ruijschop et al. (2010), we started with a single scent and developed complex variations by adding very small quantities of different scents. Such an approach served to develop stimuli objectively varying regarding complexity. All scents belonged to the fruit scent family and special care was taken to modify only scent complexity while minimizing any changes to the fundamental nature of the scent itself (Lévy, MacRae, and Köster 2006). Scents were developed in cooperation with a commercial aroma supplier who prepared scent compositions using scents that were currently available for application in retail stores.

Pretest 1

Complexity of scents was first tested in a real-world setting by applying ambient scents in a retail store. Two sets of simple and complex scents were selected; the simple scents included lemon and orange essential oils, while the complex scents were lemon-basil and basil-orange with green tea. Scents were diffused in a small decoration store over a period of two weeks. Shoppers ($N = 122$) were randomly stopped while shopping and asked to fill out a short questionnaire evaluating complexity, pleasantness, and familiarity of the scent. Spangenberg et al. (2006) demonstrated that congruence of a scent with a store results in more favorable customer responses in a retail store. Therefore, this pretest pertaining to Study 1 (field study) included dimensions of congruency and appropriateness with the store type. Each participant was asked to evaluate one scent on several seven-point semantic scales (perceived pleasantness, familiarity, congruency, appropriateness, and complexity). Orange scent and orange-basil with green tea did not differ in terms of pleasantness, familiarity, congruency, or appropriateness, $p > .05$.

The scents differed in terms of complexity ($t(53) = -2.32$, $p = .02$). Further, lemon and lemon-basil differed with regard to perceived complexity ($t(57) = -2.38$, $p = .02$) as well as familiarity ($t(54) = 2.18$, $p = .03$). These results supported use of

Table 1
Descriptive statistics for Pretest 1. Means and standard deviations for selected scents.

Dependent measure	Orange (n = 60)	Basil-orange green tea (n = 60)	Lemon (n = 62)	Basil-lemon (n = 62)
Pleasantness	3.96 (1.46) _a	4.04 (1.28) _a	4.28 (1.67) _a	3.81 (1.42) _a
Familiarity	4.07 (1.65) _a	3.82 (1.36) _a	4.58 (1.60) _a	3.60 (1.73) _b
Congruity	4.00 (1.63) _a	4.36 (1.37) _a	4.32 (1.36) _a	4.18 (1.44) _a
Appropriateness	3.68 (1.75) _a	4.17 (1.56) _a	4.26 (1.72) _a	4.18 (1.72) _a
Complexity	3.50 (1.93) _a	4.59 (1.53) _b	3.41 (1.74) _a	4.50 (1.78) _b

Note: N = 122, standard deviations in parentheses. The possible range of scores for listed values is 1–7, with higher values indicating more positive responses. For each dependent variable, means not sharing a common subscript differ at $p < .05$.

orange and orange-basil with green tea scents for the first study (Table 1).

Pretest 2

Complexity of the scents from Pretest 1 was further tested in the lab. Each participant (N = 78) was asked to evaluate a scent using seven-point semantic scales regarding each scent’s pleasantness, familiarity, likability, attractiveness, elaborateness, and complexity. To avoid possible measurement effects, each participant was randomly assigned to evaluate one of four opaque vials labeled with random numbers. Scents were comprised of 20 drops of essential oil applied to a cotton ball in the vial. They were allowed to sniff the vial as many times as they wanted while responding to questions about the respective scent. Orange and basil-orange with green tea were perceived as equally pleasant (positive/negative; $t(16) = .04, p = .97$), familiar (familiar/unfamiliar; $t(16) = -1.01, p = .33$), likable (like/dislike; $t(16) = .22, p = .83$), and attractive (attractive/unattractive; $t(16) = 1.6, p = .13$). The two scents, orange and basil-orange with green tea, differed regarding perceived complexity (simple/complex; $t(16) = -5.33, p < .001$ and uncomplicated/complicated; $t(16) = -2.18, p = .04$), and elaborateness (pure/differentiated; $t(16) = -2.91, p = .01$). Further, lemon and lemon-basil scents differed on the elaborateness dimension ($t(19) = 2.29, p = .03$), but did not differ on complexity (simple/complex; $t(19) = 1.92, p = .07$ and uncomplicated/complicated; $t(19) = 1.44, p = .17$). These two scents also differed in perceived pleasantness ($t(19) = 2.066, p = .05$) and familiarity ($t(19) = 4.61, p < .001$). Table 2 contains relevant

descriptive statistics from Pretest 2. As with Pretest 1, results support the use of the orange-based scents for the main studies.

Overall, results from both pretests support the notion that scents can differ in terms of complexity while not differing with regard to other relevant dimensions. The pretests also support the selection of orange as a simple scent and orange-basil with green tea as a complex scent for use in the four main studies.

Study 1: scent complexity and sales in a retail store

Study 1 was conducted in the field to examine how varying scent complexity affects customer behavior within an actual retail store. Given that simple scent was expected to be more fluently processed, a direct effect on consumer behavior as measured by retail purchases in the field was predicted. Ambient scents of an actual retail store were manipulated with sales serving as the primary dependent variable. Procedures largely followed published research including use of a commercial diffusion system, absence of scents competing with manipulations, and so forth (Spangenberg, Crowley, and Henderson 1996).

Method

Design, participants, and procedure

A between-participants design: simple scent (orange) × complex scent (basil-orange with green tea) × control (no scent) was used. The study was conducted from 10 am to 7 pm on weekdays over an 18-day period; conditions were randomly assigned to days of the week. Participants were 402 customers making purchases in the store and who were willing to complete the dependent measure

Table 2
Descriptive statistics for Pretest 2. Means and standard deviations for selected scents.

Dependent measure	Orange (n = 18)	Basil-orange green tea (n = 18)	Lemon (n = 21)	Basil-lemon (n = 21)
Pleasantness	2.63 (1.51) _a	2.60 (1.27) _a	2.63 (1.41) _a	4.15 (1.77) _b
Familiarity	2.13 (1.36) _a	2.90 (1.79) _a	1.50 (1.07) _a	4.85 (1.86) _b
Likability	2.75 (1.58) _a	2.60 (1.27) _a	3.25 (1.49) _a	4.38 (2.02) _a
Attractiveness	3.38 (1.41) _a	2.40 (1.17) _a	3.88 (1.36) _a	4.46 (1.81) _a
Complexity (simple/complex)	3.00 (1.31) _a	5.80 (.92) _b	3.63 (1.77) _a	5.15 (1.77) _a
Elaborateness	3.00 (2.39) _a	5.50 (1.18) _b	3.50 (2.45) _a	5.46 (1.51) _b
Complexity (uncomplicated/complicated)	3.38 (1.60) _a	4.90 (1.37) _b	4.00 (1.60) _a	5.08 (1.71) _a

Note: N = 78, standard deviations in parentheses. The possible range of scores for listed values is 1–7, with higher values indicating more positive responses. For each dependent variable, means not sharing a common subscript differ at $p < .05$.

survey. Of the total, 103 customers were exposed to the simple scent, 102 shopped in the presence of the complex scent, and 198 comprised the no scent condition. Amount of time in the store was unobtrusively monitored to ensure customers had sufficient opportunity to be impacted by the ambient scent—data were collected only from customers spending at least 5 min shopping and who had made a purchase. At least one day of no data collection was inserted between each condition to allow the previous scent to dissipate and the new scent to become completely diffused.

The study was conducted in a home decoration store in a large city in northern Switzerland offering a wide array of in-home products such as plates, candles, baskets, curtains, and so on. The retailer maintained consistent advertising, pricing, and product availability during the study, thereby reducing those potential sources of variation. Scents were diffused through the entire store at a moderate intensity using a commercial scent diffusion system. Intensity and concentration of the scent was continuously monitored to ensure that all shoppers would perceive it, but it would not be at an intensity level so as to be annoying. Exogenous, aggressive odors were not present in the store and all efforts were made to reduce the effect of other extraneous odors during the study (e.g., interviewers did not wear perfume, aftershave, or other scents).

Customers were contacted at the register after making a purchase by trained interviewers (blind to the study's hypotheses) and asked to fill out a short, self-administered questionnaire. As an incentive and a thank you for participation, customers were entered in a drawing for a store coupon. Interviewers made no reference to ambient scent and no shoppers mentioned scent in the open-ended question included in the survey.

Measures

In-store sales served as the primary dependent variable. The survey instrument also contained self-report dependent variables including an open-ended question asking how much money participants had spent in the store during the shopping trip. Accuracy of shoppers' self-reported expenditures was checked against sales receipts. Customers were also asked about characteristics of the ambient scent including: scent complexity (simple/complex; Lévy, MacRae, and Köster 2006), scent familiarity (unfamiliar/familiar; Morrin and Ratneshwar 2003), scent-store congruity (incongruent/congruent; Spangenberg et al. 2006), and scent pleasantness (pleasant/unpleasant; Spangenberg, Crowley, and Henderson 1996).

Results

Manipulation check

This check included a separate set of shoppers ($N=53$) not participating in the main study. As expected, participants in the complex condition perceived ambient scent as more complex ($M=3.88$) than those in the simple condition ($M=2.91$), $t(45)=-2.12$, $p=.04$. Perceptions in the simple condition did not significantly differ from those associated with the complex condition in terms of familiarity, $t(47)=-.78$, $p=.44$,

congruity, $t(49)=1.03$, $p=.31$, or pleasantness, $t(47)=-1.53$, $p=.13$. Thus, the manipulation was deemed successful.

Results

An ANOVA model was estimated using the three scent conditions (simple vs. complex vs. no scent). As expected, shoppers in the presence of a simple ambient scent ($M=56.83$ CHF) spent significantly more money than those shopping in the presence of a complex ambient scent ($M=43.11$ CHF) or no scent ($M=45.96$ CHF); $F_{(2,400)}=3.36$, $p=.04$. Post hoc Tukey HSD analysis showed that people spent more in the simple scent condition than in the presence of the complex scent or no scent ($p<.05$). Other comparisons were not significant. Our data also support a curvilinear relationship (as suggested by reviewers) between scent type and sales, $p=.01$. A linear relationship between scent type and sales was not significant, $p=.569$.

Discussion

Results of Study 1 support greater impact of a simple ambient scent (relative to complex) in an actual retail environment. As expected, shoppers spent more money in the presence of a simple ambient scent versus in the presence of a complex scent, or when no scent was present. That a simple scent increased purchases in a retail store is certainly of practical interest. It is important to note that the only perceived difference between the two ambient scents used in this study was complexity and that the scents did not differ in terms of familiarity, congruity, or pleasantness. Given that this study was conducted in the field, process evidence for differences in fluency associated with differing scent complexity was not part of the design. Study 2 therefore turns to the search for process evidence associated with the concept of fluency in the context of olfactory cues.

Study 2: process evidence for processing fluency

The second study was designed to test the underlying mechanism of processing fluency as related to olfactory cues. Schwarz (2004) describes processing fluency as the ease or difficulty with which new, external information can be processed while showing that processing fluency can be captured with subjective measures (e.g., subjective impressions of effort), as well as by objective measures of speed and accuracy regarding cognitive performance. In particular, research has demonstrated that processing and solving cognitive tasks depends on processing fluency (Oppenheimer 2008; Reber, Schwarz, and Winkielman 2004). This work leads to the expectation that cognitive performance should vary by the complexity of an ambient scent present during completion of the cognitive task. A processing fluency explanation would be supported, therefore, if the presence of a simple ambient scent elicits better performance on a cognitive task relative to performance in the presence of a complex scent. Study 2a tests cognitive task performance under differing olfactory conditions by measuring accuracy of mental processes (i.e., number of anagrams solved); in Study 2b processing fluency is

captured by measuring performance speed on a mental task (i.e., response latency).

Study 2a

Method

Design, participants, and procedure. The study utilized a between-participants design with three conditions: simple scent (orange), complex scent (basil-orange with green tea) and no scent (control). Undergraduates ($N=261$) at a large Northwest university participated in groups of up to ten over a single week for extra course credit. Scent conditions were randomly assigned to days of the week; diffusion throughout the controlled laboratory was at a moderate intensity and done using a commercial, retail scent diffuser. Similar to Study 1, intensity and concentration of the scent presence in the room as well as exposure to any exogenous odors during the study was monitored.

Upon arrival participants were seated and directed to the cognitive task on a computer screen. The task was adapted from published anagram problem-solving research (Baumeister et al. 1998; Galliot et al. 2007; Goode, Geraci, and Roediger, 2008). Anagram solving tasks are commonly used by researchers in psychology and marketing, most often for studies measuring cognitive load and in particular for testing problem-solving skills (Boyes and French 2010; Galliot et al. 2007; Goode, Geraci, and Roediger 2008; Muraven, Tice, and Baumeister 1998). For example, Baron and Bronfen (1994) showed that a pleasant ambient odor improved performance on anagram and word completion tasks. Anagram solving tasks have been specifically suggested for perceptual fluency assessment (Reber, Wurtz, and Zimmermann 2004).

All 25 anagrams used in Study 2a were commonly used nouns (in English). Each noun contained one or two vowels and was of similar difficulty and familiarity (± 1 standard deviation from mean difficulty and mean familiarity) as classified by Tresselt and Mayzner (1966). Participants were restricted to 3 min for the task and told to solve as many anagrams as possible (in any order they preferred). Upon completion of the anagram task participants completed a short, self-administered questionnaire.

Measures. The primary dependent variable was number of anagrams completed. Participants' cognitive task performance was also measured on a seven-point Likert scale ("How good are you at analytical type of problems?" 1 = Poor, 7 = Excellent). To rule out the possibility that scent influenced perceived difficulty of the cognitive task, previous research on cognitive load was followed (Galliot et al. 2007; Goode, Geraci, and Roediger 2008; Johnson 2011) whereby perceived difficulty of the cognitive task was assessed ("How difficult did you perceive the anagrams to be?" 1 = Not at all difficult, 7 = Very difficult). Similarly, to measure whether a participant's mood was affected by scent a four-item, seven-point scale (1 = Strongly disagree, 7 = Strongly agree) was administered ("Currently I am in a good mood; As I answer these questions, I feel cheerful; For some reason, I am not comfortable right now"; $\alpha = .70$; Peterson and Sauber 1983).

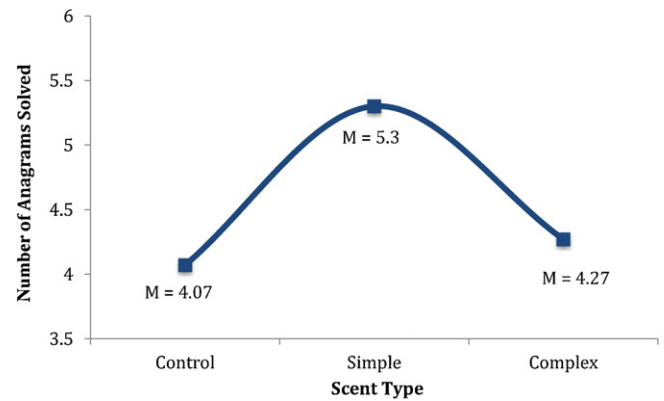


Fig. 1. Relationship between scent type and number of anagrams solved (Study 2a).

Results

One-way ANOVA revealed that participants perceived the cognitive task equally difficult across all conditions ($M_{\text{simple}} = 5.82$, $M_{\text{complex}} = 6.10$, $M_{\text{control}} = 6.09$, $F_{(2,263)} = 1.74$, $p = .18$). Further, participants' mood was unaffected by the scent type ($M_{\text{simple}} = 5.09$, $M_{\text{complex}} = 5.13$, $M_{\text{control}} = 5.10$, $F_{(2,261)} = .02$, $p = .98$). ANCOVA using scent as a fixed factor and mood measure as covariate revealed a significant main effect of scent type, such that participants in a simple scent condition ($M_{\text{simple_adjusted}} = 5.3$) solved more anagrams than participants in the complex or no-scent condition ($M_{\text{complex_adjusted}} = 4.27$, $M_{\text{control_adjusted}} = 4.07$, $F_{(2,261)} = 3.26$, $p = .04$). A linear regression showed a curvilinear relationship between scent type and number of anagrams solved, $p = .02$ (and remained significant after controlling for mood, $p = .02$) (see Fig. 1). The test for a linear relationship between scent type and number of anagrams solved was not significant, $p = .73$.

Discussion

Results of Study 2a support the argument that the nature of an ambient scent can increase processing fluency as evidenced by the greater number of correctly completed anagrams on the cognitive task for those completing the task under the simple scent condition relative to those in the complex scent condition. This study demonstrates processing fluency as objectively measured by performance of a cognitive task (Reber, Wurtz, and Zimmermann 2004). In Study 2b we further test the impact of ambient scents' level of complexity on people's cognitive processing with another objective measure (i.e., speed of mental processing).

Study 2b

Method

Design, participants, and procedure. The study utilized a between-participants design with three conditions: simple scent (orange), complex scent (basil-orange with green tea) and no scent (control). Participants were undergraduates ($N = 291$) from a large Northwest university receiving course participation credit. Scent manipulation procedure was identical to Study 2a. To allow participants to acclimate to the lab environment and

the scent in the room, the session began by welcoming participants to the lab and thanking them for their participation. All session participants were directed to the cognitive task on the computer screen in front of them. The anagram task was modified from that used in Study 2a and modeled after problem-solving research using anagrams (Baumeister et al. 1998; Galliot et al. 2007; Goode, Geraci, and Roediger 2008). In particular, participants received a list of four anagrams to solve and were asked to complete them as quickly as possible (with a maximum amount of time being dictated for all participants). As done in prior research, participants were told that they could approach them in any order they preferred (Feinberg and Ariello 2010; Goode, Geraci, and Roediger 2008; Gribben 1970; Muraven, Tice, and Baumeister 1998). The four anagrams were selected from the set of 25 anagrams used in Study 2a based on the highest percentage of correct anagram solutions from that study. Response latency was measured from the time the anagram was first presented until the time when the participant solved the last anagram (and pressed “Next” button to continue) or when the maximum allowed time limit of 4 min elapsed (in which case participants were automatically redirected to the next task). Upon the completion of the anagram task, participants completed a short, self-administered questionnaire.

Measures. The primary dependent variable was the time spent solving all four anagrams. To obtain a clear measure of time, reported results correspond to those participants who either solved all four anagrams or used the maximum amount of time allowed (240 s) for the task. The nature and significance of results, however, did not change when using the complete sample. As in Study 2a, perceived difficulty of the cognitive task was measured (“How difficult did you perceive the anagrams to be?” 1 = Not at all difficult, 7 = Very difficult) to help rule out the alternate explanation that scent influences perceived difficulty of the task (Baumeister et al. 1998; Galliot et al. 2007; Goode, Geraci, and Roediger 2008). Additionally, perceived seriousness and effort put into the task were measured on 7-point scales (“How seriously did you take the solving of the anagram task?” 1 = Not seriously, 7 = Very seriously and “How much effort did you put into anagrams solving?” 1 = Not much effort, 7 = A lot of effort) as well as perceived analytical ability and general liking of analytical problems (“How good are you at analytical type of problems?” 1 = Poor, 7 = Excellent and “How much do you like solving analytical type of problems?” 1 = I don’t like them at all, 7 = I like them a lot). Similarly, to test whether participants’ moods were affected by scent, a four-item, seven-point scale (1 = Strongly disagree, 7 = Strongly agree) was administered (“Currently I am in a good mood; As I answer these questions, I feel cheerful; For some reason, I am not comfortable right now”; $\alpha = .83$; Peterson and Sauber 1983).

Results

Manipulation check

Participants in the simple scent condition perceived ambient scent as more simple ($M = 5.35$) than participants in the complex condition ($M = 4.29$), $t(63) = 2.88, p = .005$. The simple

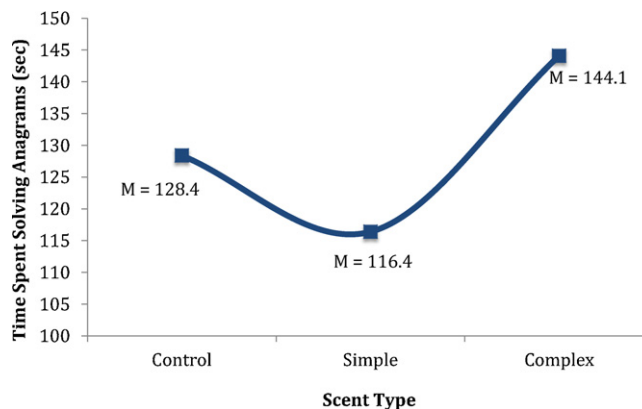


Fig. 2. Relationship between scent type and time spent solving anagrams (Study 2b).

condition did not significantly differ from the complex condition in terms of perceived scent pleasantness, $t(63) = -.63, p = .53$; likability, $t(63) = -.54, p = .59$; or attractiveness, $t(63) = -.36, p = .72$. Thus, the manipulation was deemed successful.

Confound check. One-way ANOVA found participants in all three conditions to perceive the cognitive task as equally difficult ($M_{\text{simple}} = 3.16, M_{\text{complex}} = 3.58, M_{\text{control}} = 3.31, F_{(2,289)} = 1.57, p = .21$), approached the task with equal seriousness ($M_{\text{simple}} = 5.97, M_{\text{complex}} = 5.77, M_{\text{control}} = 5.84, F_{(2,290)} = .681, p = .51$) and put similar effort into solving the task ($M_{\text{simple}} = 4.94, M_{\text{complex}} = 5.08, M_{\text{control}} = 4.92, F_{(2,289)} = .27, p = .76$). Further, participants in the three conditions did not differ in either their perceived analytical ability ($M_{\text{simple}} = 4.91, M_{\text{complex}} = 4.78, M_{\text{control}} = 4.53, F_{(2,290)} = 1.368, p = .26$) or in their general liking of analytical problems ($M_{\text{simple}} = 4.79, M_{\text{complex}} = 4.96, M_{\text{control}} = 4.68, F_{(2,287)} = .67, p = .51$). Lastly, participants’ mood was unaffected by scent type ($M_{\text{simple}} = 5.27, M_{\text{complex}} = 5.21, M_{\text{control}} = 5.30, F_{(2,289)} = .14, p = .87$).

Results. A one-way ANOVA with scent as a fixed factor revealed a significant main effect of scent type, such that participants in the simple scent condition ($M_{\text{simple}} = 116.4$) solved anagrams faster than participants in complex, or no scent conditions ($M_{\text{complex}} = 144.1, M_{\text{control}} = 128.4, F_{(2,289)} = 3.38, p = .04$). Linear regression analysis show a curvilinear relationship between scent type and time needed to solve the assigned number of anagrams, $p = .04$ (see Fig. 2). A linear relationship between scent type and time spent solving anagrams was not significant, $p = .19$.

Discussion

Results of Study 2b provide further support that the nature of an ambient scent can increase processing fluency, as evidenced by processing speed on the cognitive task. While previous work has demonstrated that processing of cognitive tasks depends on processing fluency (Oppenheimer 2008; Reber, Schwarz, and Winkielman 2004; Reber, Wurtz, and Zimmermann 2004), the current study is the first to show that the complexity of an ambient scent can similarly influence processing fluency. The literature is consistent that processing fluency (namely, the perceived ease

of processing) can be captured with objective measures such as accuracy and speed of performance on a cognitive task (Reber, Wurtz, and Zimmermann 2004). Thus, results from Studies 2a and 2b support the impact of ambient scent complexity on people's cognitive processing, thereby supporting our proposed mechanism of processing fluency. We now turn to manipulation of scent complexity in a fictitious shopping task to replicate the spending pattern found in Study 1. Study 3 is conducted in a controlled setting so that we can explore the underlying mechanism associated with processing fluency as identified in Studies 2a and 2b.

Study 3: processing fluency, scent complexity and shopping

In this study, we investigate how scent complexity may affect consumer attitudes and consequent shopping behavior in a fictitious shopping task in a controlled environment. Given that simple scent is processed more fluently, a similar spending pattern is expected to manifest as in Study 1. Additional measures of various shopping task characteristics were measured to determine the degree to which processing fluency can explain the observed consumer behavior.

Method

Design, participants, and procedure

Consistent with earlier studies, Study 3 implemented the same between-participants design with three conditions: simple scent (orange), complex scent (basil-orange with green tea) and no scent (control). Participants were undergraduate students ($N=402$) from a large Northwest university receiving course credit for participation. Scents and manipulation procedures followed those of Study 2b. Participants were asked to imagine that they would be receiving a weekend visit from some friends and, based on the items in their food pantry, to make a list of grocery items they would like to purchase to satisfy their friends' varying tastes. Given a spending limit of \$60, participants were provided a booklet containing twelve grocery items in each of seven categories (fruit juice, canned vegetables, peanut butter, canned fruit, pasta, salad dressing, and cereal). Each item was depicted via a high resolution photo and described a shelf label that also contained pricing and unit pricing information. Participants were asked to purchase at least one item from each of the fruit juice, canned vegetables, and peanut butter product categories ('required categories'), but they could select items from other categories ('extra categories') if they so desired. Participants wrote the quantity of the grocery item they desired next to the chosen item.

Measures

The primary dependent variable was the dollar amount spent while shopping. Results are based on the complete sample; the nature and significance of the results did not change when participants who spent more than the \$60 allowance were dropped. Also measured were the total number of items purchased, the number of items purchased from the required categories, as well as items from the additional product categories. To

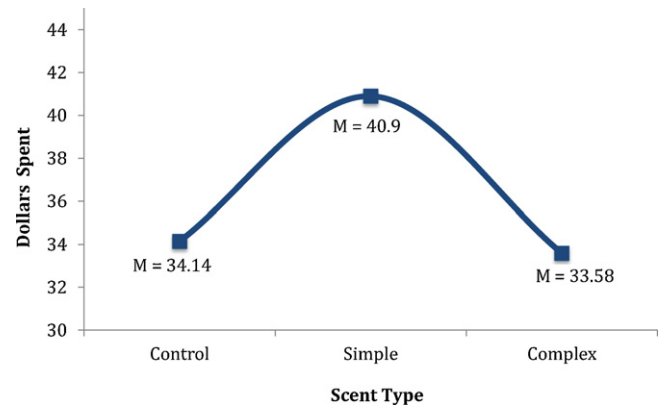


Fig. 3. Relationship between scent type and dollar amount spent (Study 3).

examine shopping behavior in the presence of ambient scent, time spent shopping was also measured as an objective measure of processing fluency. To rule out the alternative explanation that scent influences how participants approached the shopping task, perceived seriousness and effort were also measured ("How seriously did you take the shopping task?" and "How much effort did you put into deciding between products?"; 1 = Not much, 7 = Very much). To determine whether participants' mood was affected by scent, a 9-point nonverbal pictorial self-assessment (SAM) of pleasure and arousal was administered (Bradley and Lang 1994).

Results

Confound check

One-way ANOVA revealed that participants did not differ with regard to the amount of effort and seriousness they gave the shopping task ($F_{(2,399)} = 2.61, p = .08$ and $F_{(2,400)} = .21, p = .82$, respectively). Further, participants' pleasure and arousal were unaffected by scent type ($F_{(2,400)} = 1.33, p = .27$ and $F_{(2,399)} = .58, p = .56$).

Dollar amount spent

A one-way ANOVA found a main effect of scent on purchasing, such that participants spent more in the presence of a simple scent ($M = \$40.9$) than in the presence of a complex scent ($M = \$33.58$) or no scent at all ($M = \34.14), $F_{(2,401)} = 8.43, p < .001$. A post hoc Tukey HSD test showed that participants spent more in a simple scent condition than in a presence of a complex scent ($p = .001$) or control ($p = .005$) conditions. Spending in the presence of a complex scent did not differ from that in the control condition ($p = .96$). Linear regression showed a curvilinear relationship between scent type and money spent, $p < .001$ (see Fig. 3); the linear relationship between scent type and money spent was not significant, $p = .797$.

Number of items purchased

Similarly, a one-way ANOVA showed an impact of scent type on the total number of items selected. Participants chose more items in the presence of a simple scent ($M = 17.77$) than in the presence of a complex scent ($M = 15.10$) or no scent ($M = 15.51$),

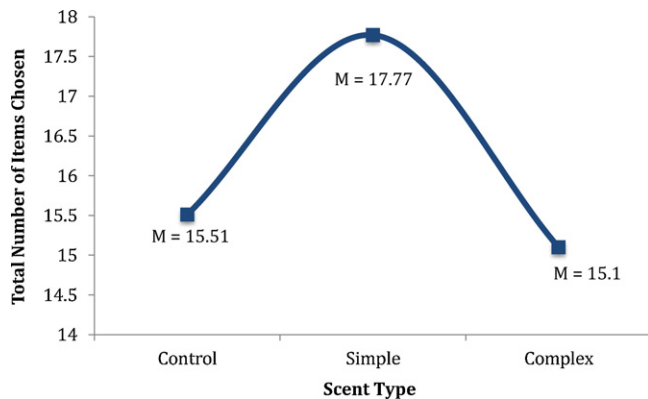


Fig. 4. Relationship between scent type and total number of items chosen (Study 3).

$F_{(2,401)} = 4.71, p = .009$. Results from linear regression analysis support a curvilinear relationship between scent type and total number of items chosen, $p = .003$ and the test for a linear relationship between scent type and total number of items chosen was not significant, $p = .69$. Further, a one-way ANOVA revealed that scent type did not affect the number of items chosen from required product categories, $p > .05$. Scent type did, however, impact the number of items chosen from extra product categories; participants chose more items from the extra categories in the presence of a simple scent ($M = 9.78$) than in the presence of a complex scent ($M = 7.56$) or no scent ($M = 7.14$), $F_{(2,401)} = 10.29, p < .001$. A curvilinear relationship between scent type and number of items chosen from extra categories was identified by linear regression analysis, $p < .001$ (see Fig. 4), while the linear relationship between scent type and items chosen from extra categories was not significant, $p = .53$.

Time spent deciding between products

A one-way ANOVA showed participants to have spent less time deciding between products in the presence of a simple scent ($M = 245.99$ s) than in the presence of a complex scent ($M = 278.31$ s) or no scent ($M = 283.23$ s), $F_{(2,395)} = 7.72, p = .001$. A post hoc Tukey HSD test showed participants to have spent less time deciding between products in the simple scent condition than in the presence of a complex scent ($p = .003$) or the control condition ($p = .002$). Spending in the presence of a complex scent and control condition did not differ ($p = .90$). Linear regression showed a curvilinear relationship between scent type and time spent shopping, $p < .001$ (see Fig. 5), while the linear relationship between scent type and money spent was not significant, $p = .66$.

Indirect effect analysis

A test of multilevel categorical variable indirect effects (Hayes and Preacher submitted for publication; Preacher and Hayes 2004) was conducted based on dummy coding (comparing simple to complex and simple to control conditions) using a bootstrap sample $n = 1000$. Mediation analysis revealed an omnibus effect of scent type on dollars spent through time spent shopping, $\beta = .002, CI (95\%) = .0004-.005$. An omnibus test was used to assess whether the independent

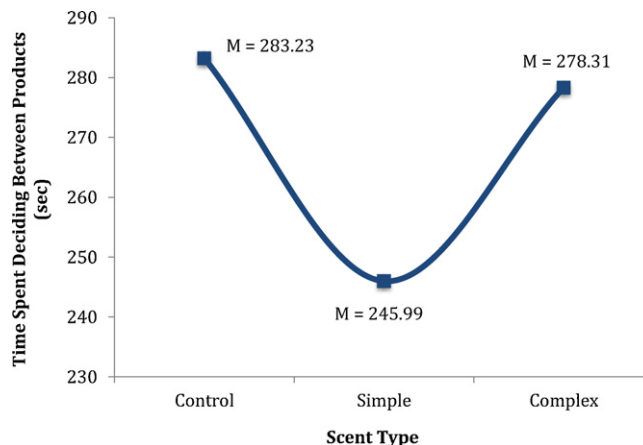


Fig. 5. Relationship between scent type and time spent shopping (i.e., deciding between products) (Study 3).

variable of scent had an effect on dollars spent without specifying the nature of the difference between group means likely responsible for that effect (Hayes and Preacher submitted for publication). When a bootstrap confidence interval for the omnibus test does not contain zero, one can conclude an indirect effect of the independent variable on the dependent variable through a mediator (Hayes and Preacher submitted for publication). Nevertheless, omnibus indirect effects can be broken into specific comparisons between levels of an independent variable. The Simple–Complex difference as well as the Simple–Control difference regarding dollars spent was mediated by time spent deciding between products, $\beta = 1.82, CI (95\%) = .73-3.19$ and $\beta = 2.10, CI (95\%) = .89-3.57$, respectively. Similarly, an omnibus effect of scent type on total number of items purchased revealed an indirect effect of time spent deciding between products, $\beta = .001, CI (95\%) = .0003-.0025$. Analysis also demonstrated an indirect effect of time spent shopping between scent type and number of items chosen from extra categories, $\beta = .001, CI (95\%) = .0001-.0014$.

Discussion

Results of Study 3 replicated the spending patterns shown in the field with Study 1 and further support the idea that customer-shopping behavior can be influenced by the complexity of an ambient scent present at the time of choice. In particular, more items were purchased more quickly in the presence of a simple scent, than in the presence of a complex scent or no scent. Importantly, analysis of indirect effects supported a processing fluency explanation such that the effect of ambient scents on shopping behavior is mediated by the time spent on the shopping task.

General discussion

Prior research has clearly demonstrated that olfactory cues can influence the perceptions and (sometimes) behaviors of consumers within retail settings. Despite the obvious commercial interest in these findings, research investigating the impact of scent on actual behavior, and identifying theoretical underpinnings for observed effects, has been limited, and

indeed in some instances apparently equivocal. Much prior work has relied upon, or assumed, the rather simplistic stimulus-organism-response model of environmental psychology rather than push for a more thorough theoretical explanation. The research reported herein helps to address this situation by presenting empirical evidence for fluency as a theoretically and normatively meaningful concept for the effects of olfactory stimuli, while demonstrating application of the effect in a real-world context.

Three lab studies and a well-controlled field study show that complexity of ambient scents, which were objectively manipulated based on an approach suggested by fluency research, can determine how a scent influences consumers. In particular, this series of studies showed that a simple or more fluent scent led to greater retail sales (Study 1), increased cognitive processing (Study 2a and 2b), and overall more favorable shopping behavior (Studies 1 and 3), while complex or less fluent scents had no such effects.

Our results also show that, contrary to conclusions drawn by many retailers attempting to implement prior olfactory research findings, not just any pleasant scent will work to a firm's benefit. The ambient scents used for this research were equally pleasant, but produced remarkably different outcomes based on scent complexity. Further, while simple and complex scents may be similar in terms of congruence with a given retail setting or product offering, a simple or fluent ambient scent was shown more effective for eliciting responses desired by retailers. Complex scents may be just that—too complex, thereby disallowing fluent processing by shoppers and reducing the likelihood of beneficial responses. Thus, the current work moves beyond the conclusions of earlier research and suggests that not just any pleasant, congruent scent will positively impact customer behavior; scent simplicity (or complexity) must also be considered.

Manipulating scent complexity through the physical structure of odors yields a deeper understanding of how olfactory cues might impact consumers and how retailers can use such stimuli to influence customer behavior. As with any empirical work, however, limitations apply. First, although our experiments and data are internally valid, the complexity manipulations in all studies used only two scents. As such, this research cannot speak to further manipulations of scent complexity which should be addressed in future research. Further, prior research has demonstrated that liking and/or familiarity of scent influences consumers' responses (Herz 2009). While we provide evidence against this alternate explanation (via two pretests and manipulation checks in two experiments), further research would be useful to completely rule out these potential effects and to examine how scent liking might moderate observed effects of complexity.

Theoretical implications

From a theoretical perspective, the current research is the first to examine olfactory cues through the lens of the metacognitive construct of fluency. Not only in a marketing context, but also in psychological research, most studies have focused on visual stimuli as objects of interest (Reber, Schwarz, and Winkielman 2004). This may be explained by the fact that the human visual

system is the most advanced sensory system and offers the most differentiated perception of a given stimulus. Many of the investigated stimulus characteristics that influence ease of processing require quite elaborate processing to unfold fluency effects. For example, to perceive different degrees of figure-ground contrasts (a common fluency manipulation), one has to perceive different elements of a given stimulus and how these relate to one another. While such a task can be visually accomplished, it is less likely to be achieved for sounds, tastes or scents (at least for normally gifted persons). On the one hand, this predominant focus on visual processing has allowed researchers to gain a deeper understanding of the processes and effects occurring in connection with experienced fluency and thereby to refine theoretical assumptions of this account. On the other hand, by neglecting other sensory domains and their possible interactions with the visual domain, many interesting relationships still await discovery.

Our results extend the existing fluency literature with two primary new insights. First, the finding that the complexity of scents is perceived, evaluated, and influential in a comparable fashion to visual stimuli suggests that other established effects might also be applied to scents. This realization is not as straightforward as it may initially appear as the olfactory system is, from an evolutionary point of view, much older than the visual system and may have worked quite differently with regard to processing fluency. Second, our work shows that processing fluency associated with one stimulus is not limited to influencing the evaluation of the same type of stimulus, but may also influence other stimuli. In particular, the effects of fluency can also take place across sensory modalities, as indicated by the positive effect that scents obviously had on customers' responses to the shopping environment. As outlined earlier, this transfer is especially likely to occur in the present context where a nonsalient stimulus category (scent) is used to induce fluency and a more salient category (retailer or product) needs to be evaluated.

The current research also has implications for prior research on olfaction in retail and marketing settings. As noted earlier, research has clearly indicated the business value of scented retail environments and products, especially when the scents are pleasant and/or congruent with a store, or other product offerings. Findings from our research suggest that the sometimes equivocal nature of this earlier work may indeed be explained by the complexity (or failure to be simple enough) of olfactory stimuli used in earlier work. As such, the current work motivates additional examination of earlier olfaction research in marketing in terms of stimulus complexity and/or other fluency determining stimulus characteristics. One area of particular interest would be future research exploring how these various dimensions (e.g., complexity and congruity) interact to influence consumer cognitions and behaviors.

Managerial implications

Our work is of obvious practical importance to retailers in that, while conventional wisdom holds that scents influence bottom line outcomes in the market, there is limited published evidence that this is the case. In fact, the effect of ambient scent

on retail purchases is rarely seen in the literature (for exceptions, see Chebat, Morrin, and Chebat 2009; Schifferstein and Blok 2002; Spangenberg et al. 2006). The current studies therefore provide important real-world evidence of olfactory effects on consumer purchase behavior, suggesting that retailers should feel confident in using such environmental manipulations in the marketplace. One key to successful implementation, however, lies in the complexity of the scent stimuli.

Indeed, the introduction of a simple scent (as used in this research) could result in significant additional revenues. For example, assuming twelve to fifteen dollars additional sales per customer for 400 shoppers per day (based on results of Study 3), with the store being open 300 days per year and an annual cost of scent infusion to be \$400,000, the expected increase in yearly revenue could be around \$1–1.4M. Given that the use of olfactory cues in a retailing context is relatively inexpensive and easy to implement, there is little to prevent a retailer who wishes to adopt scent as a component of the marketing mix. One concern levied against the use of olfactory cues is that odors can become overwhelming or offensive to certain segments of the market that are more sensitive to such cues than others. While more research is required, it seems reasonable that simple scents (as compared to more complex scents) should be less offensive or overwhelming to customers who may be hypersensitive to olfactory stimuli. Thus, the use of a more fluent scent could have the added benefit of being more appealing to a broader market. Future research aimed at understanding the interaction between consumer smell sensitivity and scent fluency would be useful.

Conclusion

While prior published research has repeatedly shown that olfactory cues can influence consumers, few studies have provided guidance beyond the notions of developing pleasant, familiar, and congruent (with products or retail environment) scents for use in retailing contexts. Our work moves beyond these initial understandings and provides practical and concrete insight into a new dimension of scent—that is, complexity—for use in retail and marketing contexts. Specifically, the fluency of an olfactory stimulus must be taken into account when applying such environmental techniques and may provide a differential advantage to firms implementing such olfactory cues in retailing contexts. Our research also suggests a clear, concrete manner by which the fluency of the scent can be manipulated. Building upon the work of Lévy, MacRae, and Köster (2006), we showed that scents with fewer component elements were perceived to be simpler and more impactful on consumers, as compared to scents with multiple elements. Additional useful inquiry could test other simple versus complex combinations of scents within the fluency paradigm.

In summary, processing fluency is clearly an important dimension of olfactory stimuli; we have demonstrated that the simplicity or fluency of a scent impacts not only cognitive processing, but also consumer purchase behavior. Findings from our studies (novel in the fluency domain) provide clear guidance to retail firms regarding the nature of scents that should

(and should not) be used in marketing settings. All else being equal, simple scents are best, and more complex scents should be avoided since they do not provide discernable benefits beyond no scent at all. By using olfactory cues that are easier to process, retailers can expect increased purchases within their stores.

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